CLAIMS

What is claimed is:

1. A method of heating a food product comprising:

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a) a blancher including a food product-receiving chamber disposed in a housing that has a food product inlet and a food product outlet, a rotary food product transport mechanism disposed in the food product receiving chamber for urging the food product toward the food product outlet, and a plurality of pairs of orifices each for introducing a fluid into the housing;

b) introducing food product into a heat transfer medium within the housing of the blancher through the inlet;

c) discharging a fluid through at least one of the plurality of pairs of orifices into the heat transfer medium;

d) heating the food product in the food product-receiving chamber;

e) urging the food product in the food product-receiving chamber toward the outlet; and

f) removing the food product from the food product-receiving chamber through the outlet.

2. The method of claim 1 wherein in step c) the fluid is a liquid that is discharged through at least one of the orifices at a flow rate of at least 20 gpm and a pressure of at least 30 psi.

3. The method of claim 2 wherein there is provided at least one bank of orifices comprised of a plurality of orifices, the blancher has a length, and in step c) the liquid is discharged from the bank of orifices at a flow rate of at least 60 gpm per foot of length of the blancher.

4. The method of claim 3 wherein the heat transfer medium comprises a liquid and further comprising the additional step of withdrawing liquid heat transfer medium from the blancher and discharging the withdrawn liquid heat transfer medium in step c).

5. The method of claim 1 wherein in step c) the fluid is a liquid discharged through at least one of the orifices at a flow rate of at least 20 gpm and a pressure of at least 80 psi.

6. The method of claim 5 wherein there is provided at least one bank of orifices comprised of a plurality of orifices, the blancher has a length, and in step c) the liquid is discharged from the bank of orifices at a flow rate of at least 60 gpm per foot of length of the blancher.

7. The method of claim 6 wherein the heat transfer medium comprises a liquid and further comprising the additional step of withdrawing liquid heat transfer medium from the blancher and discharging the withdrawn liquid heat transfer medium in step c).

8. The method of claim 1 wherein in step c) the fluid comprises a gas discharged through at least one of the orifices at a flow rate of at least 60 CFM and a pressure of at least 2 psi.

9. The method of claim 8 wherein there is a gaseous atmosphere in the blancher and further comprising the additional step of withdrawing a portion of the gaseous atmosphere from the blancher and discharging the withdrawn portion of the gaseous atmosphere in step c).

10. The method of claim 9 wherein the heat transfer medium comprises water and the gaseous atmosphere in the blancher includes water vapor.

11. The method of claim 8 wherein there is provided at least one bank of orifices comprised of a plurality of orifices, the blancher has a length, and in step c) the gas is discharged from the bank of orifices at a flow rate of at least 100 CFM per foot of length of the blancher.

12. The method of claim 8 wherein there is provided at least one bank of orifices comprised of a plurality of orifices, the blancher has a length, and in step c) the gas is discharged from the bank of orifices at a flow rate of at least 200 CFM per foot of length of the blancher.

13. The method of claim 1 wherein in step c) the fluid comprises a gas discharged through at least one of the orifices at a flow rate of at least 10 CFM and a pressure of at least 60 psi.

14. The method of claim 13 wherein there is a gaseous atmosphere in the blancher and further comprising the additional step of withdrawing a portion of the gaseous atmosphere from the blancher and discharging the withdrawn portion of the gaseous atmosphere in step c).

15. The method of claim 14 wherein the heat transfer medium comprises water and the gaseous atmosphere in the blancher includes water vapor.

16. The method of claim 13 wherein there is provided at least one bank of orifices comprised of a plurality of orifices, the blancher has a length, and in step c) the gas is discharged from the bank of orifices at a flow rate of at least 10 CFM per foot of length of the blancher.

17. The method of claim 1 wherein the food products have a density of at least 55 lb/ft^3 and in step c) there is at least one orifice through which water is discharged at a flow rate of at least 20 gpm and a pressure of at least 30 psi and there is at least one orifice through which air is discharged at a flow rate of at least 60 SCFM and a pressure of at least 2 psi.

18. The method of claim 17 wherein there is at least eight inches of depth of food product in the food product-receiving chamber.

19. The method of claim 17 wherein at least eight thousand pounds of food product per hour is removed in step f).

20. The method of claim 1 wherein the food products have a density of at least 55 lb/ft^3 and in step c) there is at least one orifice through which water is discharged at a flow rate of at least 20 gpm and a pressure of at least 30 psi and there is at least one orifice through which air is discharged at a flow rate of at least 10 SCFM and a pressure of at least 80 psi.

21. The method of claim 20 wherein there is at least eight inches of depth of food product in the food product-receiving chamber.

22. The method of claim 20 wherein at least eight thousand pounds of food product per hour is removed in step f).

23. The method of claim 1 wherein the blancher has a length, the food products have a density of at least 55 lb/ft^3, and in step c) there is at least one orifice through which water is discharged at a flow rate of at least 80 gpm per foot of blancher length and a pressure of at least 30 psi and there is at least one orifice through which air is

discharged at a flow rate of at least 10 SCFM per foot of blancher length and a pressure of at least 80 psi.

24. The method of claim 23 wherein there is at least eight inches of depth of food product in the food product-receiving chamber.

25. The method of claim 23 wherein at least eight thousand pounds of food product per hour is removed in step f).

26. The method of claim 1 wherein the blancher has a length, the food products have a density of at least 55 lb/ft^3, and in step c) there is at least one orifice through which water is discharged at a flow rate of at least 80 gpm per foot of blancher length and a pressure of at least 30 psi and there is at least one orifice through which air is discharged at a flow rate of at least 60 SCFM per foot of blancher length and a pressure of at least 2 psi.

27. The method of claim 26 wherein there is at least eight inches of depth of food product in the food product-receiving chamber.

28. The method of claim 26 wherein at least eight thousand pounds of food product per hour is removed in step f).

29. The method of claim 1 wherein the blancher has a length, the food products have a density of at least 55 lb/ft^3, and in step c) there is at least one orifice through which water is discharged at a flow rate of at least 20 gpm per foot of blancher length and a pressure of at least 80 psi and there is at least one orifice through which air is discharged at a flow rate of at least 10 SCFM per foot of blancher length and a pressure of at least 80 psi.

30. The method of claim 29 wherein there is at least eight inches of depth of food product in the food product-receiving chamber.

31. The method of claim 29 wherein at least eight thousand pounds of food product per hour is removed in step f).

32. The method of claim 1 wherein the blancher has a length, the food products have a density of at least 55 lb/ft^3, and in step c) there is at least one orifice through which water is discharged at a flow rate of at least 80 gpm per foot of blancher length and a pressure of at least 30 psi and there is at least one orifice through which air is discharged at a flow rate of at least 10 SCFM per foot of blancher length and a pressure of at least 80 psi.

33. The method of claim 32 wherein there is at least eight inches of depth of food product in the food product-receiving chamber.

34. The method of claim 32 wherein at least eight thousand pounds of food product per hour is removed in step f).

35. The method of claim 1 wherein the blancher has a length, the food products have a density of no greater than 55 lb/ft^3, and in step c) there is at least one orifice through which air is discharged at a flow rate of at least 60 SCFM per foot of blancher length and a pressure of at least 2 psi.

36. The method of claim 35 wherein there is at least eight inches of depth of food product in the food product-receiving chamber.

37. The method of claim 35 wherein at least four thousand five hundred pounds of food product per hour is removed in step f).

38. The method of claim 1 wherein the blancher has a length, the food products have a density of no greater than 55 lb/ft^3, and in step c) there is at least one orifice through which air is discharged at a flow rate of at least 10 SCFM per foot of blancher length and a pressure of at least 80 psi.

39. The method of claim 38 wherein there is at least eight inches of depth of food product in the food product-receiving chamber.

40. The method of claim 38 wherein at least four thousand five hundred pounds of food product per hour is removed in step f).

41. A blancher for heating a plurality of food products at the same time comprising:

a) a food product-receiving chamber that has a food product inlet, a food product outlet, a heat transfer medium, and a plurality of food products received therein;

b) a food product transport mechanism received in the food product receiving chamber for urging food products in the food product receiving chamber from adjacent the food product inlet toward the food product outlet; and

c) an orifice disposed in fluid flow communication with the heat transfer medium from which a fluid under pressure is discharged into the food product-receiving chamber.

42. The blancher of claim 41 wherein:

1) the food product transport mechanism comprises an auger having a plurality of pairs of axially spaced auger flights that each has a direct-contact mechanical agitation device for agitating food products by direct contact;

2) there is a plurality of pairs of the orifices disposed in fluid flow communication with the heat transfer medium each for discharging a fluid under pressure toward the food products;

3) the heat transfer medium is comprised of a liquid; and

4) the fluid is a liquid discharged from each of the orifices at a volumetric flow rate of at least 20 gpm for increasing heat transfer to the food products.

43. The blancher of claim 42 wherein the direct-contact mechanical agitation device comprises a baffle extending from the auger.

44. The blancher of claim 42 further comprising a tank that receives the heat transfer medium wherein the tank has an inlet through which the heat transfer medium is introduced.

45. The blancher of claim 44 wherein the tank further comprises an outlet through which the heat transfer medium is drained to empty the tank of the heat transfer medium.

46. The blancher of claim 42 wherein the blancher has at least as many orifices as there are auger flights and wherein there is an orifice disposed adjacent each one of the auger flights.

47. The blancher of claim 42 wherein there is an orifice between each adjacent pair of auger flights of the plurality of pairs of auger flights.

48. The blancher of claim 42 wherein there are two orifices between each adjacent pair of auger flights of the plurality of pairs of auger flights.

49. The blancher of claim 41 wherein:

1) the food product transport mechanism comprises an auger having a plurality of pairs of axially spaced auger flights that each has a direct-contact mechanical agitation device for agitating food products by direct contact;

2) there is a plurality of pairs of the orifices disposed in fluid flow communication with the heat transfer medium each for discharging a fluid under pressure toward the food products;

3) the heat transfer medium comprises a liquid; and

4) the fluid is a gas discharged from each of the orifices at a volumetric flow rate of at least 60 CFM for increasing heat transfer to the food products.

50. The blancher of claim 49 wherein the direct-contact mechanical agitation device comprises a baffle extending from the auger.

51. The blancher of claim 49 further comprising a tank that receives the heat transfer medium wherein the tank has an inlet through which the heat transfer medium is introduced.

52. The blancher of claim 51 wherein the tank further comprises an outlet through which the heat transfer medium is drained to empty the tank of the heat transfer medium.

53. The blancher of claim 49 wherein the blancher has at least as many orifices as there are auger flights and wherein there is an orifice disposed adjacent each one of the auger flights.

54. The blancher of claim 49 wherein there is an orifice between each adjacent pair of the plurality of pairs of auger flights.

55. The blancher of claim 49 wherein there are two orifices between each adjacent pair of auger flights of the plurality of pairs of auger flights.

56. The blancher of claim 41 wherein:

1) there is a first plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the first plurality of orifices discharging a liquid under pressure into the heat transfer medium;

2) there is a second plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the second plurality of orifices discharging a gas under pressure into the heat transfer medium; and

3) the heat transfer medium comprises a liquid.

57. The blancher of claim 56 wherein the liquid discharged from each of the orifices of the first plurality of orifices is water.

58. The blancher of claim 56 wherein the gas discharged from each of the orifices of the second plurality of orifices is air.

59. The blancher of claim 41 wherein:

1) there is a first plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the first plurality of orifices discharging a liquid under pressure into the heat transfer medium;

2) there is a second plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the second plurality of orifices discharging a gas under pressure into the heat transfer medium;

3) the heat transfer medium comprises a liquid;

4) the liquid discharged from each of the orifices of the first plurality of orifices is discharged at a volumetric flow rate of at least 20 gpm; and

5) the gas discharged from each of the orifices of the first plurality of orifices is discharged at a volumetric flow rate of at least 60 CFM.

60. The blancher of claim 59 further comprising a first manifold connected to the first plurality of orifices and a second manifold connected to the second plurality of orifices.

61. The blancher of claim 41 wherein the heat transfer medium comprises a liquid, the food product transport mechanism comprises an auger that rotates during operation, the auger having a plurality of pairs of spaced apart auger flights with one side of each

of the auger flights entering the liquid heat transfer medium along one side of the blancher and another side of each of the auger flights exiting the liquid heat transfer medium along the other side of the blancher, and there are a plurality of pairs of orifices arranged in a bank that is disposed in the liquid heat transfer medium along the other side of the blancher.

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62. The blancher of claim ~~63~~ 61 wherein at least some of the food products tend to gather in a clump along the other side of the blancher and the orifices direct the fluid discharged therefrom toward the clump of food products.

63. The blancher of claim 41 wherein:

1) the food product transport mechanism comprises an auger having a plurality of pairs of axially spaced auger flights that each has a direct-contact mechanical agitation device for agitating food products by direct contact;

2) there is a plurality of pairs of the orifices disposed in fluid flow communication with the heat transfer medium each for discharging a fluid under pressure toward the food products;

3) the heat transfer medium is comprised of a liquid; and

4) the liquid is discharged from each of the orifices at a pressure of at least 30 psi for increasing heat transfer to the food products.

64. The blancher of claim 61 wherein:

1) the food product transport mechanism comprises an auger having a plurality of pairs of axially spaced auger flights that each has a direct-contact mechanical agitation device for agitating food products by direct contact;

2) there is a plurality of pairs of the orifices disposed in fluid flow communication with the heat transfer medium each for discharging a fluid under pressure toward the food products;

3) the heat transfer medium is comprised of a liquid; and

4) the fluid discharged from each of the orifices is a liquid at a pressure of at least 80 psi.

65. The blancher of claim 41 wherein:

1) the food product transport mechanism comprises an auger having a plurality of pairs of axially spaced auger flights that each has a direct-contact mechanical agitation device for agitating food products by direct contact;

2) there is a plurality of pairs of the orifices disposed in fluid flow communication with the heat transfer medium each for discharging a fluid under pressure toward the food products;

3) the heat transfer medium comprises a liquid; and

4) the fluid discharged from each of the orifices is a gas at a pressure of at least 2 psi and at a flow rate of at least 100 CFM.

66. The blancher of claim 41 wherein:

1) there is a first plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the first plurality of orifices discharging a liquid under pressure into the heat transfer medium;

2) there is a second plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the second plurality of orifices discharging a gas under pressure into the heat transfer medium;

3) the heat transfer medium comprises a liquid;

4) the liquid discharged from each of the orifices of the first plurality of orifices is discharged at a pressure of at least 30 psi; and

5) the gas discharged from each of the orifices of the first plurality of orifices is discharged at a pressure of at least 2 psi.

67. The blancher of claim 41 further comprising:

1) a tank;

2) a perforate drum disposed in the tank and which comprises the food product-receiving chamber;

3) a first bank of the orifices each in fluid flow communication with the tank and pointed toward the perforate drum wherein the first bank of the orifices extends in an axial direction relative to the tank and has at least two of the orifices;

4) a second bank of the orifices each in fluid flow communication with the tank and pointed toward the perforate drum wherein the second bank of the orifices extends in an axial direction relative to the tank and has at least two of the orifices; and

5) a third bank of the orifices each in fluid flow communication with the tank and pointed toward the perforate drum wherein the third bank of the orifices extends in an axial direction relative to the tank and has at least two of the orifices.

68. The blancher of claim 67 wherein each of the banks of the orifices is disposed between the tank and the perforate drum.

69. The blancher of claim 67 wherein the fluid discharged from each of the orifices passes through the perforate drum.

70. The blancher of claim 69 wherein the fluid discharged from each of the orifices impinges against at least one of the food products in the perforate drum.

71. The blancher of claim 41 further comprising:

1) a tank;

2) a perforate drum disposed in the tank into which are disposed the food products, wherein the food product transport mechanism is disposed in the perforate drum and rotates in a clockwise direction during operation;

3) a first bank of the orifices with each of the orifices in fluid flow communication with the tank, wherein i) the first bank of the orifices generally extends in an axial direction relative to the tank and has at least two of the orifices, ii) the first bank of the orifices is disposed between a 6 o'clock position and an 8 o'clock position; and iii) a gas is discharged through each of the orifices of the first bank of the orifices;

4) a second bank of the orifices with each of the orifices in fluid flow communication with the tank, wherein i) the second bank of the orifices generally extends in an axial direction relative to the tank and has at least two of the orifices, ii) the second bank of the orifices is disposed between a 7 o'clock position and a 9 o'clock position; and iii) a liquid is discharged through each of the orifices of the first bank of the orifices; and

5) wherein the plurality of food products has a density of greater than 55 lbs/ft^3.

72. The blancher of claim 41 further comprising:

1) a tank;

2) a perforate drum disposed in the tank into which are disposed the food products, wherein the food product transport mechanism is disposed in the perforate drum and rotates in a clockwise direction during operation;

3) a first bank of the orifices with each of the orifices in fluid flow communication with the tank, wherein i) the first bank of the orifices generally extends in an axial direction relative to the tank and has at least two of the orifices, ii) the first bank of the orifices is disposed within about 65° of a centerline that extends perpendicular to horizontal and extends through the center of the perforate drum; and iii) a gas is discharged through each of the orifices of the first bank of the orifices;

4) a second bank of the orifices with each of the orifices in fluid flow communication with the tank, wherein i) the second bank of the orifices generally extends in an axial direction relative to the tank and has at least two of the orifices, ii)

the second bank of the orifices is disposed within a band that extends between 45° and 85° of the centerline; and iii) a liquid is discharged through each of the orifices of the first bank of the orifices; and

wherein the plurality of food products has a density of greater than 55 pounds per cubic foot.

73. The blancher of claim 74 wherein each of the food products is comprised of meat, the heat transfer medium is water at a temperature of at least 120° Fahrenheit, and the food product transfer mechanism is rotated such that each food product resides in the blancher for at least 3 minutes such that at least one of the food products is pasteurized.

74. The blancher of claim 74 wherein the food product transport mechanism comprises a helical auger having a plurality of pairs of axially spaced apart auger flights that have at least one baffle disposed between each adjacent pair of the auger flights.

75. The blancher of claim 41 wherein the heat transfer medium comprises a liquid, and further comprising a first conduit in fluid flow communication with the blancher, a second conduit in fluid flow communication with the orifice, and a pump in fluid flow communication with the first conduit and the second conduit that withdraws the liquid heat transfer medium and discharges the liquid heat transfer medium out the orifice.

76. The blancher of claim 41 further comprising an atmosphere in the blancher, a first conduit in fluid flow communication with the blancher, a second conduit in fluid flow communication with the orifice, and a pump in fluid flow communication with the first conduit and the second conduit that withdraws the atmosphere and discharges the atmosphere out the orifice.